


<b>PRE-APPEAL BRIEF REQUEST FOR REVIEW</b>		Docket Number Q95054	
Mail Stop AF Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450	Application Number	Filed	
	10/583,081	June 15, 2006	
	First Named Inventor		
	Tadashi INO		
	Art Unit	Examiner	
	1796	Robert C BOYLE	
<p style="text-align: center;">WASHINGTON OFFICE <b>23373</b> CUSTOMER NUMBER</p>			
<p>Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.</p> <p>This request is being filed with a notice of appeal</p> <p>The review is requested for the reasons(s) stated on the attached sheet(s). Note: No more than five (5) pages may be provided.</p> <p><input checked="" type="checkbox"/> I am an attorney or agent of record.</p> <p>Registration number <u>33,276</u></p> <div style="text-align: right;">         _____        Signature     </div> <div style="text-align: right;">       _____        Abraham J. Rosner        Typed or printed name     </div> <div style="text-align: right;">       _____        (202) 293-7060        Telephone number     </div> <div style="text-align: right;">       _____        July 19, 2010        Date     </div>			

**PATENT APPLICATION**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re application of

Docket No: Q95054

Tadashi INO, et al.

Appln. No.: 10/583,081

Group Art Unit: 1796

Confirmation No.: 9129

Examiner: Robert C BOYLE

Filed: June 15, 2006

For: FLUOROPOLYMER, PROCESS FOR PRODUCING FLUOROPOLYMER,  
ELECTROLYTE FILM, OBJECT HAVING IMMOBILIZED ACTIVE SUBSTANCE,  
AND SOLID POLYMER ELECTROLYTE TYPE FUEL CELL

**PRE-APPEAL BRIEF REQUEST FOR REVIEW**

**MAIL STOP AF - PATENTS**

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

Pursuant to the Pre-Appeal Brief Conference Pilot Program, and further to the Examiner's Final Office Action dated April 19, 2010, Appellants file this Pre-Appeal Brief Request for Review. This Request is also accompanied by the filing of a Notice of Appeal.

Appellants turn now to the rejections at issue.

Claims 1-5, 7-8, 17-21 and 23-24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,150,426 to Curtin in view of U.S. Patent 3,085,083 to Schreyer as evidenced by the definition of "electrolyte" in Hawley's Condensed Chemical Dictionary, 14<sup>th</sup> Edition, 2002. Claims 1-8 and 17-24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over WO 2004/018527 to Tatemoto in view of Schreyer, where US 2005/0228127 was cited as the English language equivalent of Tatemoto.

The electrolyte membrane of claim 1 (and the immobilized active substance material of claim 18) comprises a fluoropolymer containing acid/acid salt groups and having -CF<sub>2</sub>H groups at polymer chain terminals. Furthermore, the electrolyte membrane (immobilized active substance material) is stable against Fenton reagent [OH radicals] and elution of fluoride ion from the fluoropolymer is not more than 12 ppm.

Curtin and Tatemoto were each cited as disclosing electrolyte membranes of a fluoropolymer with a  $\text{SO}_3\text{M}$  group. Schreyer was cited as teaching the formation of fluoropolymers with  $-\text{CF}_2\text{H}$  end groups.

The Examiner also considered Schreyer as providing motivation to combine for the reason that terminating the polymer in a highly stable  $-\text{CF}_2\text{H}$  group is said to add to the thermal stability and corrosion resistance of the polymer.

Appellants request reconsideration for the following reasons.

Investigators in the field of polymers containing acid/acid salt groups believe that  $-\text{CF}_2\text{H}$  group is an unstable functional group resulting in the problem of gradual polymer decomposition. The state of the art is disclosed in paragraph [0004] of U.S. 2006/063903 and paragraph [0018] of U.S. 2006/0287497.

Paragraph [0004] of U.S. 2006/063903 A1 is reproduced below:

However, a perfluorinated polymer having sulfonic groups to be used as a polymer contained in a membrane and an electrode usually has unstable functional groups such as  $-\text{COOH}$  groups,  $-\text{CF}=\text{CF}_2$  groups,  $-\text{COF}$  groups and  $-\text{CF}_2\text{H}$  groups at some molecular chain terminals, and therefore, there was such a problem that a polymer gradually decomposes during long-term fuel cell operations, followed by decreasing the power generation voltage. In addition, there was such a problem that the fuel cell operation cannot be conducted because decrease of the mechanical strength due to the polymer decomposition, locally causes pinholes, breaking, abrasion or the like.

Paragraph [0018] of U.S. 2006/0287497 is reproduced below:

The present inventors considered that since a linear perfluoropolymer having sulfonic acid groups which has been commonly used for fuel cells, has unstable functional groups such as  $-\text{COOH}$  groups,  $-\text{CF}=\text{CF}_2$  groups,  $-\text{COF}$  groups and  $-\text{CF}_2\text{H}$  groups at same molecular chain terminals, such a polymer gradually decomposes during long-term operation when used for an electrolyte material for polymer electrolyte fuel cells, whereby the power generation voltage decreases and the membrane strength decreases to locally cause pinholes, breaking, abrasion or the like, and they have found that the durability can be greatly improved by fluorinating (contacting with fluorine gas) such a polymer so as to stabilize the molecule terminals by perfluorination. However, in a case where the polymer was exposed to severe operation conditions, such durability was not good enough. Accordingly, they have conducted a further study for improvement of the durability, and as a result, have found that the durability can be remarkably improved by fluorinating a polymer having alicyclic structures in its main chain and further having sulfonic acid groups, as compared with the durability improved by fluorinating the conventional polymer.

However, contrary to the conventional belief of investigators in this field of art, Appellants found that the fluoropolymer of claim 1 containing acid/acid salt groups and having -CF<sub>2</sub>H groups at polymer chain terminals tolerates Fenton's reagent (i.e., OH radicals) to thereby achieve the present invention.

As set forth in the Response to Arguments bridging pages 6-7 of the final Office Action dated April 19, 2010, the Examiner further cited Schreyer as teaching that the -CF<sub>2</sub>H group is a stable group that avoids degradation resulting from the formation of carboxylate groups, such that Appellants' argument is not persuasive.

Appellants respond as follows. GB 1210794 (of record) discloses that -CF<sub>2</sub>H end group is relatively unreactive. See page 1, line 19. Furthermore, the unstable end groups which may be stabilized by the process of the present invention include carboxylate and vinyl end groups, as disclosed in U.S. Patent No. 3,085,083 and other end groups which are convertible to a more stable form, for example, -CF<sub>2</sub>H and amide groups.

Namely, those skilled in this field of art recognize that -CF<sub>2</sub>H is relatively stable, but convertible to more stable group, namely, -CF<sub>3</sub>.

Such technical knowledge was a basis for finding that -CF<sub>2</sub>H was too unstable to provide a membrane capable of being used in a severe environment such as the inside of a fuel cell.

It is well known that OH<sup>-</sup> concentration is extremely high around the cathode of a fuel cell. In other words, a fuel cell on the cathode side presents a strongly alkaline environment.

-CF<sub>2</sub>H is easily converted to a -CF=CF<sub>2</sub> in the presence of strong alkali. The evidence is J. Org. Chem. 1989, 5640-5642 (Nguyen et al) and 5642-5644 (Wakselman et al) (copies attached). Thus, -CF<sub>2</sub>H is not chemically stable.

Although Schreyer discloses that -CF<sub>2</sub>H is thermally stable, Schreyer does not disclose -CF<sub>2</sub>H is chemically stable.

Therefore, one skilled in the art would consider that -CF<sub>2</sub>H must be avoided to make an electrolyte membrane based on his technical knowledge even when reading the disclosure of Schreyer.

Curtin et al and Tatemoto et al, primarily relied upon by the Examiner disclose no polymer-containing acid/acid salt groups and having -CF<sub>2</sub>H groups at polymer chain terminals as required by present claims 1 and 8.

Schreyer does not disclose that polymers having  $-\text{CF}_2\text{H}$  groups have resistance to OH radicals. Schreyer only teaches thermal stability of copolymers having no acid/acid salt groups. See col. 1, lines 70-71.

Therefore, there is no teaching or suggestion in the cited prior art which would lead one of ordinary skill to modify the fluoropolymers of Curtin et al or Tatemoto et al (having an acid/acid salt group) with the endgroups taught by Schreyer (disclosing fluorocarbon polymers having no acid/acid salt groups).

Appellants further comment as follows.

(1) Additional Documents

The Examiner considered that “Both Curtin and Tatemoto teach fluoropolymers, therefore the process of Schreyer could be used with Curtin and Tatemoto.”

The fluoropolymer with  $\text{SO}_3\text{M}$  group must be resistant to OH radical.

Curtin et al, *Advanced Materials for Improved PEMFC Performance and Life*, Journal of Power Sources 131 (2004) 41-48 discloses that OH radical attacks any H-containing terminal bonds present in the polymer. See page 42, right-hand column, lines 20-30. H-containing terminal bonds are included in such end groups as disclosed in Pianca et al, *Endgroups in Fluoropolymers*, Journal of Fluorine Chemistry 95 (1999) 71-84. See page 72, left-hand column, lines 19-25 (both previously submitted with the Response under 37 C.F.R. § 1.116 filed July 15, 2009).

$\text{CF}_2\text{H}$  group is clearly unstable in the field of Curtin. Therefore, a person skilled in this field of art would not combine the applied references. This is because Curtin teaches a fluoropolymer having  $\text{SO}_3\text{M}$  group.

(2) Schreyer

The Examiner further states that “these references contradict the statements of Schreyer regarding the stability of  $-\text{CF}_2\text{H}$  endgroups” (paragraph 43), and that “the references cited by the Applicant only give a list of several functional groups, with no mechanistic information of the stability or decomposition” (paragraph 48).

However, there is no conflict.

U.S. 2006/0063903 and U.S. 2006/0287497 teach that  $\text{CF}_2\text{H}$  endgroup is unstable against OH radical. The additional references give mechanistic information on the stability or decomposition. In contrast, Schreyer teaches that  $-\text{CF}_2\text{H}$  endgroup is thermally stable.

The Examiner also states that “one of ordinary skill in the art would recognize that stability is a relative term” (paragraph 49).

That is true.  $-\text{CF}_3$  group is stable and  $-\text{CF}_2\text{H}$  and  $-\text{COOH}$  groups are unstable against OH radical at the time the invention was made.

Since different stabilities might be necessary for different applications as the Examiner states in paragraph 49, a skilled artisan would select  $-\text{CF}_3$  group to improve the stability of a polymer with  $\text{SO}_3\text{H}$  group.

The Examiner further states “U.S. 2006/0063903 states that conversion of  $-\text{COOH}$  to  $-\text{CF}_2\text{H}$  has been proposed to stabilize the chain terminals” (paragraph 50).

However, the subject passage cites U.S. Patent 3,085,083 to Schreyer which does not disclose that polymers having  $-\text{CF}_2\text{H}$  groups have resistance to OH radicals and which only teaches thermal stability of copolymers having no acid/acid salt groups. U.S. 2006/0063903 does not suggest that  $\text{CF}_2\text{H}$  is useful as an endgroup, but rather that  $-\text{CF}_3$  is required for a polymer with  $\text{SO}_3\text{H}$  group. See [0033] of U.S. 2006/0063903.

For the above reasons, it is respectfully submitted that the claims are patentable over the cited prior art. Appellants therefore respectfully request withdrawal of the final rejection upon review by the Pre-Appeal panel.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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WASHINGTON OFFICE

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